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APPLICATION NUMBER: *60/544,618*
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Certified by

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Customer No. 31013 **Docket No. 161485-00710**

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

Mail Stop Provisional Patent Application
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

This is a request for filing a Provisional Application for Patent under 37 C.F.R. § 1.53(c).

Inventor(s) and Residence (city and either state or foreign country):

Timothy Thomson - West Newbury, Massachusetts

For **INDICATOR COMPOSITION AND DEVICE**

1. ☒ 5 sheets of specification

2. ☒ A check in the amount of $80.00 is enclosed in payment of the required fee. The Commissioner is hereby authorized to charge and additional fees or credit any overpayment to Deposit Account No. 50-0540.

3. ☒ Please direct all communications relating to this application to the address of:

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4. ☒ Applicant hereby states pursuant to 37 C.F.R. § 1.27(c)(1) that Applicant is a small entity.

5. ☒ This invention was not made by an agency of the United States Government or under a contract with an agency of the United States Government.

Dated: February 13, 2004

Respectfully submitted,

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PROVISIONAL APPLICATION FOR LETTERS PATENT

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Background of the Invention

It has been recognized that consumers often will use a household product beyond the point considered by the manufacturer to be its useful life. This is particularly problematic where the purpose of the device is to deliver an active ingredient. Active ingredients such as soaps are delivered from sponge materials but the soap is eventually depleted enough to make the sponge ineffective. Where the purpose of the product is to deliver a disinfectant, the inability to tell when the disinfectant is exhausted leaves the consumer with the predicament of buying a replacement product before it is necessary to do so or, more often of using a product after it has lost its effectiveness.

A system that either detects the continued delivery of an active ingredient or, alternatively, indicates the number of actual uses of a device would have great utility. This is especially the case where the ingredient functions to control disease, e.g. a disinfectant.

Description of the Invention

We have discovered that hydrophilic polyurethane becomes stained by many indicator molecules. If the active ingredient has a characteristic pH, the color of the indicator molecule responds to the pH of the active ingredient until it is exhausted. Alternatively, if the indicator molecule responds to a particular chemical moiety, active ingredients containing that moiety may be detected by the indicator.

Alternatively, we have found that we can encapsulate within hydrophilic polyurethane an erodable or water soluble polymer containing a component that stains the polyurethane a color. When the polymer erodes or dissolves, the indicator will respond to the environment and change color or otherwise indicate the change.

It is not necessary that an entire device be made of hydrophilic polyurethane. The system is effectively implemented by coating a section of the device with the polyurethane containing the dye and the erodable or soluble polymer.

EXAMPLE I

Staining of a hydrophilic polyurethane

A hydrophilic polyurethane foam (HPUR) was produced by emulsifying equal portions of water and a hydrophilic polyurethane prepolymer (Hypol 2000, Dow Chemical USA). The foam was allowed to cure for 1 hour and then dried to constant weight. A 20 gram sample of the foam was placed in 1.0 liters of water containing 100mg of bromothymol blue (BTB). The decrease in the intensity of the color was monitored with a spectrophotometer. Figure 1 shows the spectral data. This indicates the extraction/immobilization of the BTB by the HPUR.

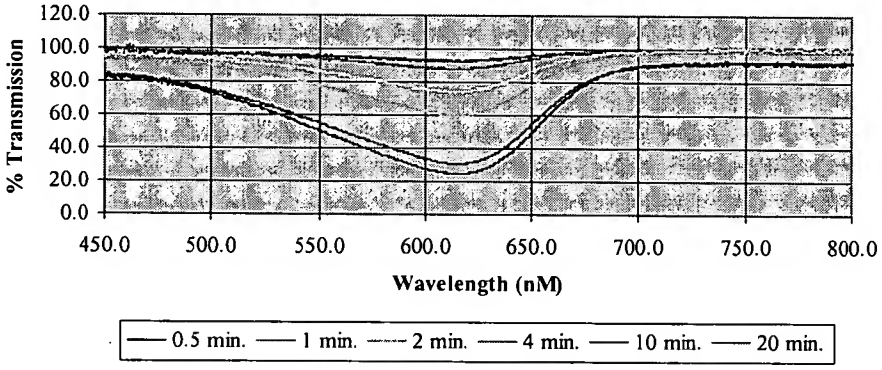


Figure 1: Immobilization of BTB by HPUR

EXAMPLE II

Five grams of each of Pluronic F87, F108 and F127 were placed in an aluminum weighing pan. 100 mg of a water soluble dye was weighed into each. The pans were placed in

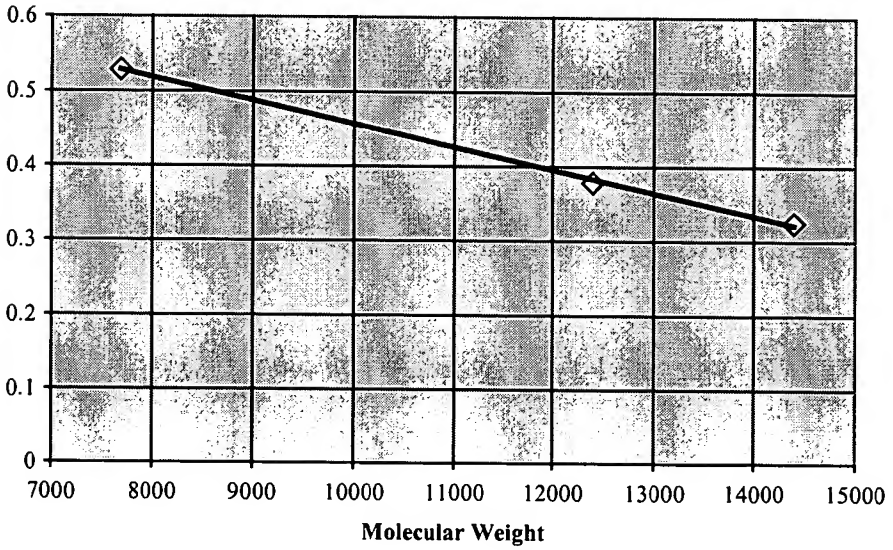
an oven at 95°C. The Pluronics all melted and the dye was mixed to affect dissolution. The pans were taken from the oven and allowed to cool. All samples solidified.

One of the Pluronic samples (still in the weighing pan) was placed in the tank and a timer started. As the Pluronic, dissolved it released the dye. The rate of increase in the intensity of the color was monitored by a spectrophotometer. The experiment was repeated for each of the subject Pluronics.

The solution rates for the three polymers are summarized in the following table.

Polymer Matrix	Release Rate (mg/min.)
Pluronic F87	0.529
Pluronic F127	0.381
Pluronic F108	0.325

The release rate data in Table 1 is plotted below as a function of molecular weight.



EXAMPLE III

Bromothymol Blue was immobilized in a sponge of hydrophilic polyurethane. The sponge was dried and then soaked in a 10% citric acid solution. The sponge was squeezed to remove excess solution and dried to constant weight.

The sponge was then immersed in water for 2 seconds. It was then removed and squeezed to remove excess water. The yellow color of the sponge indicated the present of citric acid in the sponge. The sponge was again immersed in fresh water, squeezed and inspected for color. This procedure was repeated 15 times, at which point the sponge was noticeably green in color, indicating the complete removal of the citric acid.

EXAMPLE IV

A small amount of Hypol 2000 was emulsified with an equal portion of water. Before the emulsion solidified, it was brushed onto the side of a commercial sponge mop in a patch of about 1 inch by 2 inches. After curing, a solution of BTB was painted onto the HPUR patch and allowed to soak into it for 10 minutes. Excess dye was washed off with water. The sponge was then dried.

A portion of Pluronic F127 was melted and a small amount of citric acid was dissolved in it. While molten, it was painted over the HPUR patch with a significant amount of overlapping. Two grams of Pluronic were applied to the sponge in this manner.

A pail of water was prepared using a commercial floor washing soap.

Over a period of five days, the treated sponge mop was immersed in the pail, squeezed five times under the soap water, removed and squeezed dry. The color was inspected and the sponge left to dry in air for a minimum of four hours. After fourteen immersions, the color of the sponge changed from yellow to blue, indicating the end of its useful life.